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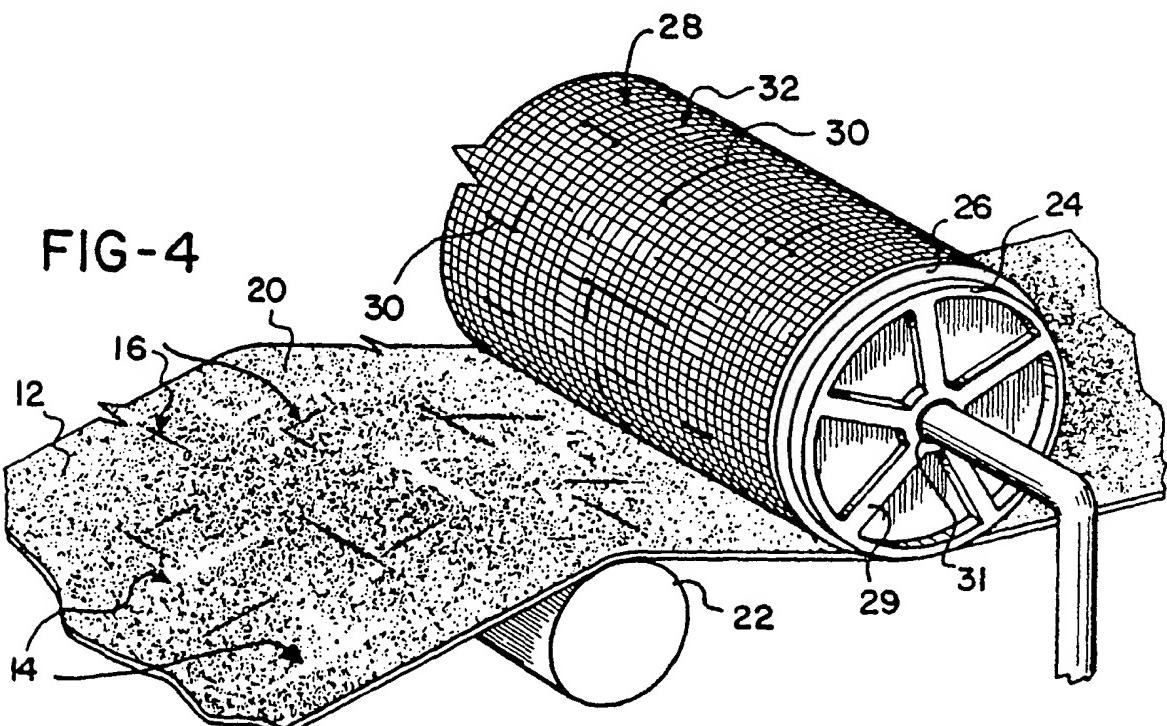
(71) Applicant
The Mead Corporation (USA—Ohio),
Courthouse Plaza Northeast, Dayton, Ohio 45463,
United States of America

(72) Inventor
James Robert Waters

(74) Agent and/or Address for Service
Baron & Warren,
18 South End, Kensington, London W8 5BU

(54) Dandy roll for manufacturing paper having simulated oxford cloth watermark

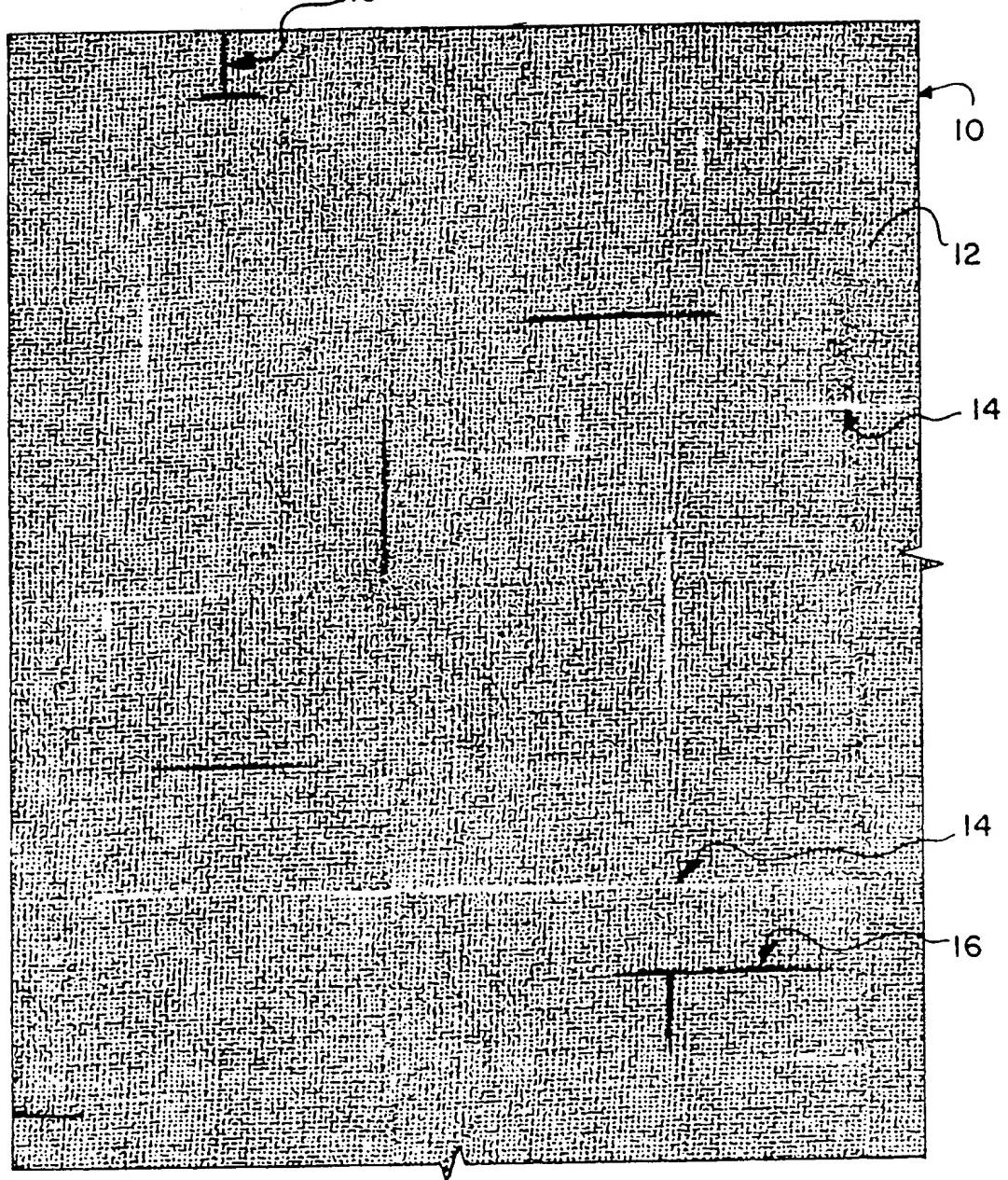
(57) A dandy roll for producing paper bearing a watermark which simulates oxford cloth comprises a cylindrical wire screen (28) mounted on a cylindrical framework (29). Electro wire segments (30) are soldered to the outer face of the screen. In addition, selected segments of the wires forming the screen (28) are removed to form pockets (32). The wire segments (30) and pockets (32) are oriented parallel to the wires forming the screen and are positioned on the dandy roll in an apparently random manner.



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FIG-1



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FIG-2

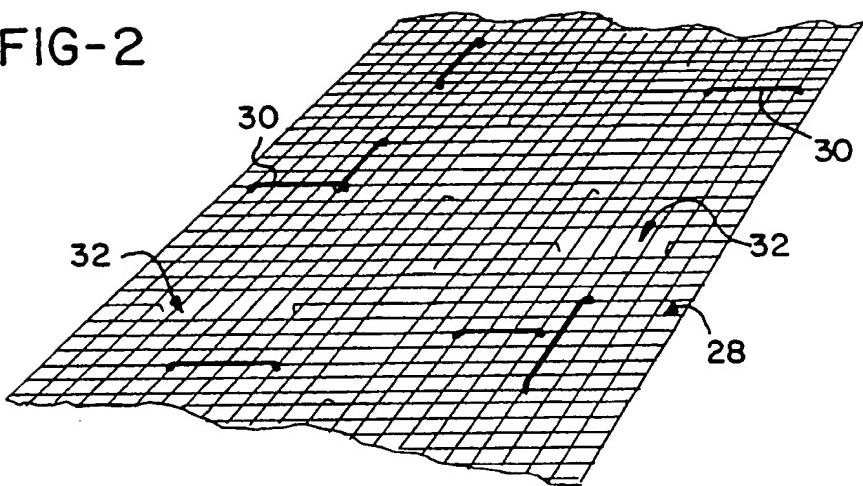


FIG-3

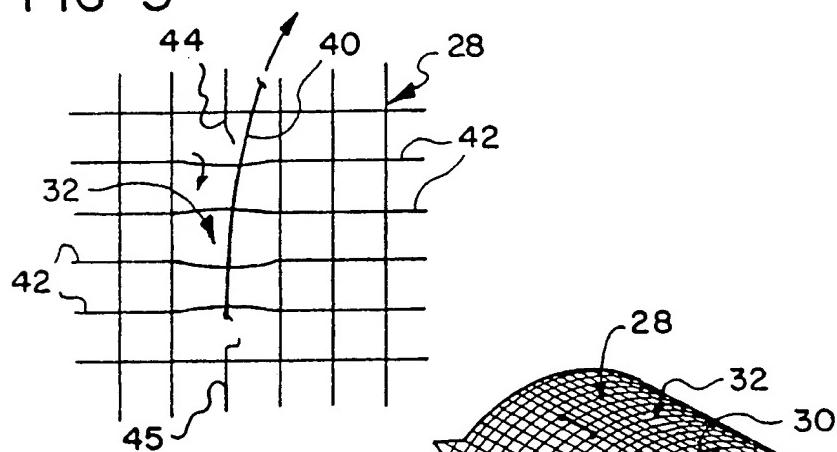
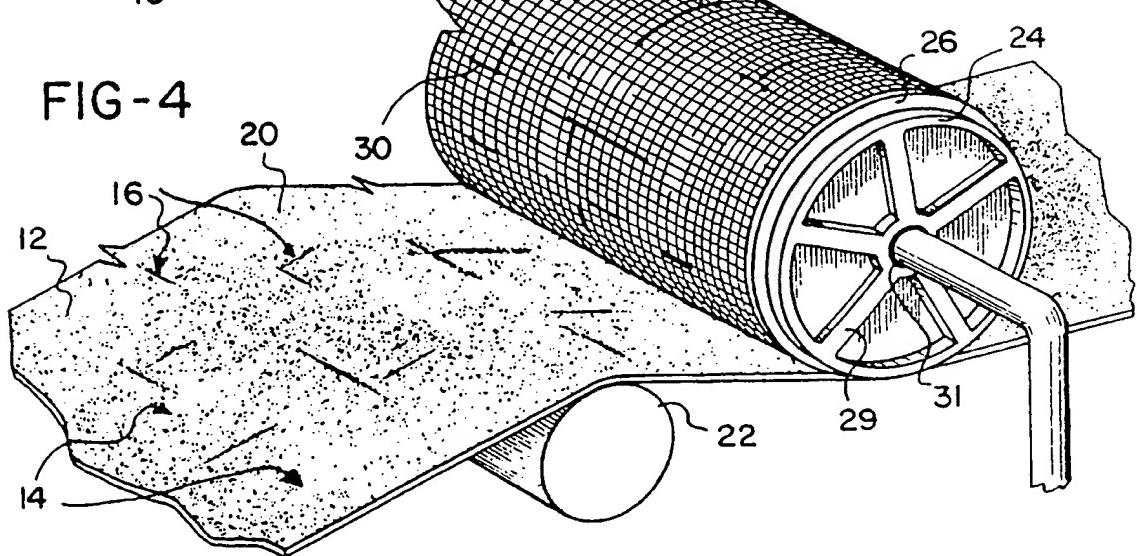


FIG-4



SPECIFICATION

Dandy roll for manufacturing paper having simulated oxford cloth watermark and related method for papermaking

The present invention relates to a dandy roll useful in producing paper having a watermark which simulates oxford cloth.

- 10 In papermaking, watermarks are conventionally formed by contacting the paper stock while it is still damp with a dandy roll having raised and/or recessed areas on the surface. An opaque mark known as a "shaded mark" 15 is formed on the paper in areas contacting the recesses on the surface of the dandy roll and is the result of pulp fibers accumulating in the recesses as the paper stock travels under the dandy roll on the papermaking machine. Translucent marks, known as "wire marks," are 20 formed in the paper in areas contacting the raised areas on the surface of the dandy roll. These marks are the result of the raised surface of the roll displacing the fibers in the 25 stock resulting in areas in which the fibers are less concentrated and the paper is more translucent.

It is conventional in the art to form shaded marks by depressing the surface of the wire 30 screen forming the dandy roll and to form wire marks by soldering wire segments, known as electro wires, to the surface of the dandy roll screen. See, for example, U.S. Patent 353,666 to Z. Crane, Jr. (1886) and 35 U.S. Patent 1,571,715 to Fearing (1926). It has also been known to watermark paper by altering the drainage rate of the Fourdrinier screen by modifying the weave in the screen such as by using larger gauge wire to form 40 the screen or by omitting a wire from the screen altogether. See, for example, U.S. Patent 1,616,222 to Harrigan (1927).

An object of the present invention is to provide a dandy roll which is useful in manufacturing paper bearing a watermark which simulates oxford cloth.

Thus, from one aspect, the present invention provides a dandy roll useful in manufacturing paper having a watermark design which 50 simulates oxford cloth, said dandy roll comprising a cylindrical wire screen mounted upon a cylindrical framework, and screen having a plurality of substantially straight electro wire segments soldered to the outer face 55 thereof, said soldered wire segments being oriented further having a plurality of substantially straight pockets formed therein, said pockets being formed by removing selected segments of the wires forming said screen, 60 said soldered wire segments and said pockets being randomly positioned on said dandy roll so as to provide watermarks which simulate the appearance of oxford cloth when said dandy roll is used in papermaking.

65 A further object of the present invention is

to provide a process for producing paper which carries a watermark simulating oxford cloth.

70 Thus, from another aspect, there is provided, in a papermaking process which comprises contacting damp paper stock with a dandy roll to form a watermark in said stock, said dandy roll comprising a cylindrical framework having a cylindrical wire screen mounted 75 thereof, the improvement wherein:

a plurality of substantially straight electro wires are soldered to the surface of said screen and said screen has formed therein a plurality of substantially straight pockets, said 80 pockets being formed by removing selected segments of the wires forming said screen, said pockets and said soldered wires being oriented parallel to the wires forming said screen and being randomly positioned on said dandy roll so as to provide a watermark which simulates oxford cloth.

In order that the invention may be more readily understood, reference will now be made to the accompanying drawings, in 90 which:-

Figure 1 is an overview of a sheet of paper manufactured in accordance with one embodiment of the present invention, bearing a simulated oxford cloth watermark;

95 Figure 2 is a partial overhead view of a dandy roll screen embodying the present invention;

Figure 3 is an expanded view of the dandy roll screen of Fig. 2 showing the surface 100 modification used to form shaded marks; and

Figure 4 is a perspective view of a dandy roll embodying the present invention on a conventional papermaking machine.

Fig. 1 is illustrative of a paper bearing the 105 type of watermark produced in accordance with one embodiment of the present invention.

In Fig. 1, a paper sheet 10 is shown bearing a watermark which simulates oxford cloth. The simulated weave is made up of a woven background pattern 12 which has simulated "imperfections" therein in the form of translucent lines 14 and opaque lines 16.

These lines are arranged to simulate the variations which are normally observed in oxford cloth due to variations in the fibers, the weave and dye. In addition to the simulated weave, the paper may bear one or more conventional watermarks such as the name of a paper manufacturer, a company logo, or the like.

The paper of Fig. 1 is manufactured using the dandy roll embodying the invention in conjunction with standard papermaking techniques. The dandy roll is usually positioned 125 near the end of the papermaking machine where the paper stock leaves the wire, as is conventional in the art. At this point, the stock is sufficiently damp that the fibers forming the paper can be displaced by the surface of the 130 dandy roll. A typical arrangement is shown in

Fig. 4 where paper web 20 is supported on a table of rollers 22 as it passes into contact with the dandy roll 24.

The dandy roll is constructed of a cylindrical frame 26 which is wrapped with a wire screen 28. The frame is constructed in a conventional manner. Typically, a spiral truss wire (not shown) is wound in either clockwise or counter-clockwise direction between two spidered heads 29 (one shown) on each of the dandy roll. Longitudinal wires (not shown) are then typically soldered across the length of the roll between the spidered heads. Another truss wire is then spirally wound around the circumference of the roll in the direction opposite the winding of the first truss wire to provide rigidity to the cylindrical frame. Each spidered head has a journal (31) protruding from its center which holds the dandy roll in place on the papermaking machine. These journals are not necessary if the dandy roll is mounted with a trunnion drive. In this case, the dandy heads are not spidered but have a concave groove around each open head which matches the trunnion drive wheel. The wire mesh cover 28 is affixed to the cylindrical frame by soldering to the frame heads and seaming the edges of the screen across the length of the roll. The screen 28 is positioned on the dandy roll with its wires running longitudinally and circumferentially of the roll.

To produce a watermark which simulates oxford cloth, the wire screen used on the dandy roll is preferably formed with a larger mesh and from larger diameter wire than the screens conventionally used on dandy rolls. Conventional dandy rolls are designed to smooth the paper and are constructed with screens having a relatively small mesh (e.g., 35 to 40 mesh) which does not mark the paper. By using a larger mesh and a larger wire in the present invention, a composite watermark having translucent and opaque points is imparted to the paper which simulates a textile weave.

In accordance with preferred embodiments of the present invention, the dandy roll screen mesh is in the range of about 10 to 30 mesh with screens ranging from about 15 to 25 mesh being most preferred. These screens are usually formed from wires ranging from about 0.014 to 0.020 inch in diameter.

As is commonly known, oxford cloth does not have a perfectly uniform appearance but contains imperfections of variations due to variations in the fibers and/or weave. In accordance with the present invention, simulated imperfections are reproduced in the watermark as randomly distributed short, substantially straight, shaded marks 16 and wire marks 14.

To produce the wiremarks 14, a plurality of substantially straight electro wires 30 is soldered to the surface of the dandy roll screen 28. The electro wires are randomly posi-

tioned on the dandy roll screen to run in the same direction as the wires forming the screen. The wire segments 30 are preferably the same diameter as the wire forming the screen 28. The length of the segments 30 will vary with the artist's conception of oxford cloth, but they will usually range from about 0.5 to 2 inches.

The shaded marks 16 are formed by pockets 32 in the dandy roll screen 28. Conventionally, recesses useful in forming shaded marks are formed in dandy roll screens by annealing the screen and locally deforming the screen to produce a recess by die-pressing. This technique cannot be used in simulating oxford cloth because the shaded mark which results is two to three times wider than the screen mesh. This is substantially broader than a typical oxford cloth imperfection. It is also a disadvantageous technique because the wire screen must be removed from the dandy roll to produce the recess. Accordingly, it was necessary to develop a means for producing recesses suitable for forming narrow shaded marks to accomplish the present invention.

In accordance with the present invention, narrow pockets 32 useful in simulating oxford imperfections are formed in the dandy roll screen by removing a segment of the wire 40 forming the screen as shown in Fig. 3. This is accomplished by cutting the segment 40, which ranges from approximately 0.5 to 2 inch, from the screen and removing it. The ends 44 of the wire 45 having the segment 40 removed are pushed firmly into the wire screen so that pick outs will not occur as the dandy roll rides the paper stock. The screen forming wires 42 intersecting the removed segment 40 are left intact and an elongated pocket 32 is thereby provided in the space left by the removed segment which collects fiber. This produces a shaded mark which is of approximately the same width as the mesh of the wire screen.

By randomly arranging the pockets 32 and the electro wire segments 30, a watermark which simulates oxford cloth can be obtained. The recesses and segments may run both circumferentially and longitudinally of the dandy roll and, as in any random arrangement, a number of the recesses 32 and/or electro wire segments 30 may intersect.

The intensity of the watermark can be controlled using conventional technique such as increasing the pressure of the dandy roll on the paper stock or by driving the dandy roll faster than the paper stock.

Having described the invention in detail and by reference to specific embodiments thereof, it will be apparent that numerous variations and modifications are possible without departing from the scope of the invention as defined by the following claims.

1. A dandy roll useful in manufacturing paper having a watermark design which simulates oxford cloth, said dandy roll comprising a cylindrical wire screen mounted upon a cylindrical framework, said screen having a plurality of substantially straight electro wire segments soldered to the outer face thereof, said soldered wire segments being oriented parallel to the wires forming said screen, said screen further having a plurality of substantially straight pockets formed therein, said pockets being formed by removing selected segments of the wires forming said screen, said soldered wire segments and said pockets being randomly positioned on said dandy roll so as to provide watermarks which simulate the appearance of oxford cloth when said dandy roll is used in papermaking.
2. The dandy roll claimed in claim 1, wherein the wires forming said screen run longitudinally and cylindrically about said dandy roll.
3. The dandy roll claimed in claim 1 or 2, wherein said wire screen has a mesh in the range of about 10 to 30.
4. The dandy roll claimed in claim 1, 2 or 3, wherein said wire screen is formed from wire ranging from about 0.014 to about 0.020 inch in diameter.
5. The dandy roll claimed in any preceding claim, wherein said pockets and said electro wire segments range from about 0.5 to about 2 inch in length.
6. In a papermaking process which comprises contacting damp paper stock with a dandy roll to form a watermark in said stock, said dandy roll comprising a cylindrical framework having a cylindrical wire screen mounted thereon, the improvement wherein:
- 40 a plurality of substantially straight electro wires are soldered to the surface of said screen and said screen has formed therein a plurality of substantially straight pockets, said pockets being formed by removing selected segments of the wires forming said screen, said pockets and said soldered wires being oriented parallel to the wires forming said screen and being randomly positioned on said dandy roll so as to provide a watermark which simulates oxford cloth.
- 45 7. The papermaking process claimed in claim 6, wherein said wire screen is mounted on said cylindrical framework with its wires running parallel and circumferentially about said dandy roll.
- 50 8. The papermaking process claimed in claim 6 or 7, wherein said wire screen has a mesh ranging from about 10 to 30.
- 55 9. The papermaking process claimed in claim 6, 7 or 8, wherein said wire screen is formed from wire ranging from about 0.014 to about 0.020 inch in diameter.
- 60 10. The papermaking process claimed in any of claims 6 to 9, wherein said pockets and said electro wires range from about 0.5

to 2 inch in length.

11. A dandy roll substantially as hereinbefore described with reference to Figs. 2, 3 and 4 of the accompanying drawings.

70 12. Papermaking apparatus including a dandy roll as claimed in any of claims 1 to 5 or 11.

13. A papermaking process substantially as hereinbefore described with reference to the accompanying drawings.

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